Method of Test for
SIEVE ANALYSIS OF MINERAL FILLER
DOTD Designation: TR 102M-97

I. Scope

A. This procedure is intended to determine the particle size distribution of mineral fillers by sieve analysis.

B. Reference Documents
1. DOTD TR 108, Splitting and Quartering Samples
2. DOTD TR 113, Dry Sieve Analysis of Fine and Coarse Aggregates
3. AASHTO M 92, Wire Cloth Sieves for Testing Purposes
4. DOTD Materials Sampling Manual

II. Apparatus

A. **Balance** - a balance having a capacity of 1 kg or more, sensitive to 0.1 g

B. **Sieves** - sieves conforming to AASHTO Designation M92

C. **Drying apparatus**
1. **Oven** - an oven capable of maintaining a temperature of 110±5°C
2. **Hot plate** - electric or gas hot plate, equipped with a suitable heat dispersing shield, to evenly distribute heat to sample drying pan.

Note 1: The use of hot plate drying in the field is allowed where ovens are not available. Open flame hot plates shall be so equipped as to not allow direct contact of the flame with the drying pan.

D. **Stirring apparatus** - a mechanically operated stirring apparatus, including special dispersion cups. The stirring device shall have an electric motor with a no load speed of not less than 10,000 rpm, attached to a vertical shaft fitted with paddles made of metal, plastic, or hard rubber, similar to that shown in Figure 1. Dispersion cups conforming to either design shown in Figure 1 shall be used to contain the sample while it is being dispersed.

E. **Desiccator** - Jar or other suitable container with tightly fitting lid, containing water-absorbing agent, such as silica gel, for allowing samples to cool without absorbing hygroscopic moisture.

F. **Goggles and face mask/filter**

G. **Worksheet** - Aggregate Test Report, DOTD Form No. 03-22-0745 (Figure 2)

III. Health Precautions

Handling of mineral fillers and similar materials can generate a significant amount of dust. Proper ventilation and the use of goggles and face mask/filters is necessary to ensure personal health as well as for safety compliance.

IV. Sample

Sample shall be obtained in accordance with the DOTD Materials Sampling Manual, and consist of not less than 1500 g of dry material.

V. Procedure

A. Reduce the size of the sample in accordance with DOTD TR 108 to obtain a representative portion of material of approximately 100 g. Determine and record the mass to the nearest 0.1 g on the worksheet as Initial Dry Total Mass.

B. Place sample in dispersion cup, and add water until the cup is approximately 2/3 full.

C. Mount cup into stirring device and disperse the sample for 5 minutes.

D. Remove the cup and pour the dispersed sample onto a 53 μm sieve.

E. Wash the sample on the sieve with a low velocity water stream, gently agitating the sieve during the washing process.

F. Continue the washing/agitating process until the wash water is relatively clear.

G. Place the sieve containing the sample in the oven and dry to constant mass at 110±5°C.

Note 2: Constant mass for drying purposes is defined as less than 0.1% by mass loss between successive mass determinations no less than 15 minutes apart.

H. Remove sample from the oven and place it in the desiccator and allow to cool to room temperature.

I. Using the sieve sizes required by the specifications of the particular project, sieve the sample in accordance with DOTD TR 113.

J. After sieving, determine the mass of the portion of the sample remaining on each sieve and record on the worksheet to the nearest 0.1 g.

VI. Calculations

A. Calculate the percent retained on each sieve (R) to the nearest 0.01 percent using the following formula:

$$R = \frac{A}{W_T} \times 100$$

where:

A = mass of material retained on sieve, g
W_T = initial mass of sample tested, g
100 = constant, to convert answer to %

example:

A = 0.1 g
W_T = 100.2 g

$$R = \frac{0.1}{100.2} \times 100$$

$$= 0.000998 \times 100$$

$$= 0.0998$$

$$R = 0.10$$

B. Calculate to the nearest 0.01% the percent coarser for each sieve size (C_x) using the following formula:

$$C_x = \Sigma \{R_{x+1} \cdots R_{x+i}\} + R_x$$

where:

R_{x+i} = percent retained on the each sieve used with larger openings than sieve X.
R_x = percent retained on sieve X.

Note 3: *For the largest sieve used for a particular sample, the percent coarser equals the percent retained.*

example:

R_{600} = 0.00
R_{180} = 0.09
R_{75} = 0.49
R_{53} = 1.09

C_{600} = % coarser than the 600 μm sieve
C_{600} = 0.00
R_{600} = 0.00

and

C_{180} = % coarser than the 180 μm sieve

$$C_{180} = 0.00 + 0.09$$

$$C_{180} = 0.09$$

and

C_{75} = % coarser than the 75 μm sieve

$$C_{75} = 0.00 + 0.09 + 0.49$$

$$C_{75} = 0.58$$

and

C_{53} = % coarser than the 53 μm sieve

$$C_{53} = 0.00 + 0.09 + 0.49 + 1.09$$

$$C_{53} = 1.67$$

C. Calculate the percent passing (P_x) for each sieve size to the nearest 1% using the following formula:

$$P_x = 100.00 - C_x$$

where:

C_x = percent coarser than sieve X
100.00 = constant

example:

C_{600} = 0.00
C_{180} = 0.09
C_{75} = 0.58
C_{53} = 1.67

$$P_{600} = 100.00 - 0.00$$
$$= 100.00$$
$$P_{600} = 100$$

$$P_{180} = 100.00 - 0.09$$
$$= 99.91$$
$$P_{180} = 100$$

$$P_{75} = 100.00 - 0.58$$
$$= 99.42$$
$$P_{75} = 99$$

$$P_{53} = 100.00 - 1.67$$
$$= 98.33$$
$$P_{53} = 98$$

VII. Report

Report the Percent Passing (P) each sieve required by the appropriate specifications to the nearest whole percent.

VIII. Normal Test Reporting Time

Normal test reporting time is 3 days.

TOLERANCES FOR STIRRING PADDLES

(a) diameter - 19.05 ± 1.60 mm
(b) longest diameter - 24.76 ± 1.60 mm

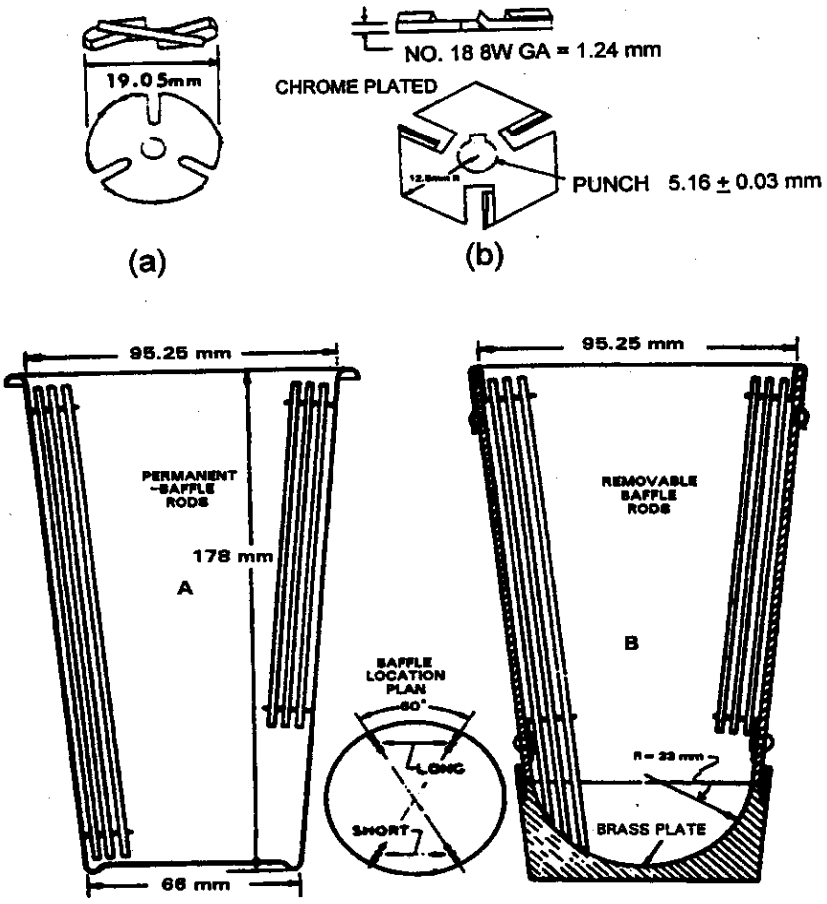

Figure 1

Upper: Detail of Stirring Paddle
Lower: Dispersion Cups

MATT MENU SELECTION - 2

Louisiana Department of Transportation and Development
AGGREGATE TEST REPORT

DOTD 03-22-0745
Rev. 7/95

Project No. 222-22-2222 | Material Code 439 | Lab No. 22-999169
Date Sampled 10-19-96 | Submitted By 0304 | Quantity 500
Purpose Code 3 | Source Code AA04 | Spec Code 1 | P.O. No.
Date Tested 10-29-96 | Ident MF-069 | Plant Code | Frict.Rating (1-4)
Item No. | Date Rec'd (lab) 10/20/96 | Sampled By: M.J.

Remarks 1

Tested By H.S. | Date 10/29/96 | Checked By Q.B.W. | Date 11/01/96

DOTD TR 102, 112, 113 & 309

Unit 1 = grams 2 = pounds

Sieve mm	Sieve In.	Wt. Retained	% Retained	% Coarser	% Passing
63	2 1/2				
50	2				
37.5	1 1/2				
31.5	1 1/4				
25.0	1				
19.0	3/4				
16.0	5/8				
12.5	1/2				
9.5	3/8				
4.75	No. 4				
Wt Matl.in Pan					
Acc. Total					

Initial Dry Total Wt | % Diff:

Unit 1 = grams 2 = pounds

Sieve mm/um	Sieve No.	Wt. Retained	% Retained	% Coarser	% Passing
2.36	8				
2.00	10				
1.18	16				
600	30	0.0	0.00	0	100
425	40				
300	50				
180	80	0.1	0.09	0	100
150	100				
75	200	0.5	0.49	1	99
53	270	1.1	1.09	2	98
Wt Matl.in Pan		0.2			
Decant Loss		98.3			
Acc. Total		100.2			

Initial Dry Total Wt 100.2 | % Diff: 0

Dry Wt After Washing 1.9

Remarks 2:

DOTD TR 428

Liquid Limit | Plastic Limit
No. of Blows | Wt Cup + Wet Soil,g
Wt Cup + Wet Soil,g | Wt Cup + Dry Soil,g
Wt Cup + Dry Soil,g | Wt Water
Wt Water | Cup No.
Factor | Wt Cup, g
Cup No. | Wt Dry Soil
Wt Cup, g | % Moisture
Wt Dry Soil | Plasticity Index
% Moisture

Absorption (T84 or T85)	
Spec Grav SSD (T84 or T85)	
Spec Grav APP (TR 300)	
Effective Spec Grav (TR 300)	
Opt Moist Content,% (TR 418)	
Maximum Density (TR 418)	
Lab Comp Method (TR 418)	
Cement, % (TR 432 or SPECIFIED)	
Lime, % (TR 416 or SPECIFIED)	
Other (Additive) Code %	
Clay Lumps, % (TR 119)	
Friable Particles, % (TR 119)	
Clay Lumps & Friable Particles % (TR 119)	
Flat or Elongated Part,% (TR 119)	
Coal & Lignite, % (TR 119)	
Glassy Particles, % (TR 119)	
Iron Ore, % (TR 119)	
Wood, % (TR 119)	
Total (Clay Lumps, Fri.Part., Iron Ore, Coal & Lignite, Wood), % (TR 119)	
Foreign Matter, % (TR 109)	
Clam Shell, % (TR 110)	
Soundness, % Loss (T 104)	
Abrasion, % Loss (T 96)	
Colorimetric Test (1 = Pass, 2 = Fail) (T 21)	
Asphalt Content, % (TR 307)	
Retained Asphalt Coating, % (TR 317)	
Percent Crushed (TR 306)	
Retained Marshall Stability (TR 313)	
Resistivity (TR 429)	
pH (TR 430)	
Organic Content, % (TR 413)	
Sand Equivalent (TR 120)	

Approved By: | Date:

Figure 2
Aggregate Test Report (02-22-0745)